Programme on Man and the Biosphere (MAB)
Programme sur l'homme et la biosphère (MAB)

MAB Information System
Biosphere Reserves
Compilation 4, October 1986

Système d'information du MAB
Réserves de la biosphère
Compilation 4, octobre 1986

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Préparée pour l'Unesco par le Centre de surveillance continue de la conservation de la nature de l'UICN

A contribution to GEMS - Global Environment Monitoring System

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INTRODUCTION

Compilation 4 on Biosphere Reserves (MAB Information System, October 1986), provided descriptions of all sites designated by the MAB Bureau up to September 1986. Since then there have been two further meetings of the MAB Bureau at which new biosphere reserves have been designated: October 1986 and March 1987. This supplement to Compilation 4 provides an update, covering the 14 new sites and two extensions to existing sites, bringing the total of the biosphere reserve network to 266 sites in 70 countries.

This supplement has been prepared for the MAB Bureau by the IUCN Conservation Monitoring Centre, January 1988.

CONTENTS

Algeria	
Parc National du Tassili	Accepted October 1986
Bolivia	
Estación Biológica Beni	Accepted October 1986
Burkina Faso	
Forêt Classée de la Mare aux Hippopotames	Accepted October 1986
China	
Fujian Wuyishan Nature Reserve	Accepted March 1987
Fanjingshan Mountain Conservation Area	Accepted October 1986
Xilin Gol Natural Steppe Protected Area	Accepted March 1987
Cuba	
Baconao Biosphere Reserve	Accepted October 1986
Cuchillas del Toa Biosphere Reserve	Accepted October 1986
Guanahacabibes Peninsular	Accepted October 1986
German Democratic Republic	
Middle Elbe Biosphere Reserve	Extended and renamed October 1986
Mexico	
Reserva de la Biosfera "El Cielo"	Accepted October 1986
Reserva de la Biosfera de Sian Ka'an	Accepted October 1986
Netherlands	
Waddenzee State Nature Reserve	Accepted October 1986
Sweden	
Lake Torne Arera	Accepted October 1986
Union of Soviet Socialist Republics	
Tsentralnosibirskii State Nature Reserve	Accepted October 1986
United States of America	
Carolinian-South Atlantic Biosphere Reserve: Santee Delta-Cape Romain subregion	Extended March 1987

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NAME Parc National du Tassili

MANAGEMENT CATEGORY II (National Park)
IX (Biosphere Reserve)
World Heritage Site (criteria ii, iii and iv)

BIOGEOGRAPHICAL PROVINCE 2.18.07 (Sahara)

GEOGRAPHICAL LOCATION Tassili Plateau covers an area in the south-east of Algeria. The national park is bounded to the south by the international border with Niger and to the east by that with Libya. 23°00'-26°50'N, 5°20'-12°00'E

DATE AND HISTORY OF ESTABLISHMENT The site was established as a 'Historic Monument' and was designated as a national park by the Ministry of Culture. Decree No. 72-168, which was passed on 27 July 1972, created the Tassili National Park, the Historic Monument status was established in December 1979. Designated a World Heritage Site in 1982. With the acceptance of Tassili Plateau as a biosphere reserve in October 1986, the area of the national park was extended to cover the entire plateau.

AREA 7,200,000ha. Extended from national park area of 300,000ha created in 1972.

LAND TENURE The Tassili massif is pastureland used by nomadic tribes and is therefore state property. In the oases and "centres of cultivation", the local tribes are the owners.

ALTITUDE 1,100-2,158m. The altitude of the plateau varies from about 1500 metres in the north and north-west to 1800m in the centre and south.

PHYSICAL FEATURES The area covers the Tassili Plateau which runs a distance of 700km from north-west to south-east and is on average 100km wide. Tassili is a mountainous region in the middle of the Sahara, to the east of the Hoggar massif. The plateau forms part of a sandstone layer which surrounds the Precambrian crystalline shield of Hoggar Mountain. It is made up of the Inner Tassili deposits (Ordovician sandstones) and the Outer Tassili deposits (Devonian sandstones), separated by the Intra-tassilian trench of clay-sandstones. In the south-south-west part, the plateau rises up in an impressive escarpment some 600m above the ergs (shifting sand dunes). The plateau experienced a succession of wet and dry periods in the past and owes its morphological structure and its extraordinary network of steep-sided valleys to one of these paleoclimatic wet periods. At the end of the Upper Pleistocene period, there were huge lakes (in what are today the great ergs) which were fed by rivers flowing down from the Tassili. In some areas perfect plateaux have been formed by fluvial action but their surfaces are furrowed by narrow, deep canyons and wide, dried-up river beds. Elsewhere, wind erosion and the arid climate have strewn the plateaux with rock formations resembling ruins, known as "stone forests". Relatively recent volcanic deposits cover the sandstone and form the Adrar massif of 2,158m. Water is always present in this region; it remains in deep shaded rocky chasms and oueds. The only permanent river in the central Sahara is at Iherir. In the fresh water areas of the Iherir Valley aquatic mosses secrete travertine which forms natural

dams and lakes cascading from one level to another (Kerzabi, 1986). The landscape has been shaped by severe river and wind erosion which have carved out extraordinary landforms e.g. canyons, riverbeds and dried lakes. Combined with features such as regs, ergs and "stone forests", this makes the landscape of considerable interest.

CLIMATE For the last 10-15,000 years, the whole area has been becoming steadily drier, though this process was alleviated to some extent by a slightly wetter period from 4000 to 2000 BC. The plateau is hyperarid, but there are sub-arid microclimates suitable for relict fauna and flora to survive. Mean annual rainfall is 30mm and mean annual temperature is 20.3°C at an altitude of 1,100m.

VEGETATION While the plateau itself is extremely barren, there are areas of locally high humidity within the Tassili. Here, deep valleys remain green even though the rest of the massif is arid. The Saharan flora has elements of Mediterranean, Sudano-Deccan and Saharo-Sindien species. The mountains (Hoggar and Tassili) support a complex relict flora with a combination of all three elements. The main relict Saharan-Mediterranean flora tree species are the cypress "tarout" Cupressus dupreziana, of which there are about 240 specimens left, olive "aleo in Tamahaq" Olea laperrini and myrtle "tafeltest" Myrtus nivellei. The latter two species grow at the bottom of the wadis or besides permanent waterholes or temporary waterholes - which exist after rainfall and are called "gueltas". Other species include Nerium oleander, Teucrium lavandula, Trianthema pentandra, Silene kiliana, Lupinus pilosus and Convolvulus fatmensis.

FAUNA The fauna is diverse and has both tropical and palaearctic origins. That present to-day has been influenced by climatic fluctuations in the past. There are high numbers of spiders, insects and reptiles in relation to mammals. Threatened species include Barbary sheep Ammotragus lervia (V) and cheetah Acinonyx jubatus (V). Locally rare species include gundi Ctenodactylus vali and large-toothed rock hyrax Procavia capensis. roan antilope Hippotragus equinus, addax Addax nasomaculatus (E) and scimitar oryx Oryx dammah (E) seem to have disappeared. The whole region is important for resting migratory palaearctic birds, species including Eurasian bittern Botaurus stellaris, little bittern Ixobrychus minutus, black-crowned night-heron Nycticorax nycticorax, squacco heron Ardeola ralloides, white stork Ciconia ciconia, glossy ibis Plegadis falcinellis, short-toed eagle Circaetus gallicus, lesser kestrel Falco naumanni, European hobby F. subbuteo, European quail Coturnix coturnix, Eurasian spotted crake Porzana porzana, corncake Crex crex (abundant) and northern stone-curlew Burhinus oedicnemus.

CULTURAL HERITAGE The entire site is of international importance for a series of ancient cave paintings. The most noteworthy pre-historic remains include: rock paintings in the national park and the plateau of Tasghirt; rock engravings of large fauna and of man in the Wadi Djerat Canyon; rock engravings of the fauna of the Sahara on the Plateau of Dider; stone monuments at Fadnoun; rich archeological remains in the southern zone; and neolithic remains, such as sculpture, pottery, grinding implements and enclosure walls as well as material from the lower and middle paleolithic periods, in the Fort Tarat region and in the Djanet region. A chronological sequence in cave paintings exists. For example, those of the Equidian period present stylised figures and frequent scenes of moufflon hunting, while in those of the Cameline period incorporate inscriptions in tifinagh characters, which is the same alaphabet as used by the Tuareg today. Radio-carbon dating has indicated the archaeological remains as being from the period 6000 to 2000 BC.

LOCAL HUMAN POPULATION The total population of the plateau is approximately 3,000, consisting of sedentary and nomadic people. The majority of the plateau is unoccupied. Stock raising and agriculture are confined to the centres, while grazing is confined generally to the wadi floor. Settlements at the edge of the area include Djanet (the largest, with 5,000 inhabitants) and Illizi.

VISITORS AND VISITOR FACILITIES The number of tourists are increasing and an airport has been constructed at nearby Djanel. Crossing of the massif is generally only practicable for four wheel drive vehicles while access to most areas is by foot or on camel. The office of the Tassili National Park (OPNT) is located in Djanet. It controls and supervises tourism in the national park.

SCIENTIFIC RESEARCH AND FACILITIES It is planned to establish a station within the reserve which will act as a base for studies on the flora and fauna. At present, most facilities are located in the surrounding villages. Ongoing studies include: ageing by dendochronology of the Duprey cypress, natural resource inventories and conservation of the rock-art.

CONSERVATION MANAGEMENT Emphasis is placed on conserving the rock-art sites and relict cypresses. A management plan exists for only one region of the area, near Djanet, where wardens and guides control visitor movements. A management plan for the whole Tassili Plateau is under preparation with the aim of giving priority to protecting the most sensitive areas. Zones have not yet been delineated, but buffer areas are planned that include areas of ergs that surround the area: Erg Admer to the south-south-west, Erg Tihodaine to the south-west and Erg Isaouane to the north. Work on the management plan has included a seminar held in Djanet from 22-27 December 1986 and work by a Unesco consultant in January 1987 with the national authorities. Draft recommendations are currently being examined by the national authorities (MAB, 1987).

MANAGEMENT PROBLEMS The ecosystems of the area are very fragile and are vulnerable to changes in the equilibrium between the human population and the environment. The impact of tourism poses a problem, particularly the impact of litter and threat to resources, such as the cypress which is attractive to collectors.

STAFF Forty-four

BUDGET No information

LOCAL ADMINISTRATION Office du Parc National du Tassili, Ministere de la Culture, Parc Zyriab, Salah Bouakouir, Alger

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NAME Estacion Biologica Beni

MANAGEMENT CATEGORY IV (Managed Nature Reserve) and IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 8.35.12 (Andean Cloud Forest)

GEOGRAPHICAL LOCATION The site is in the provinces of Ballivian and Yacuma, within the Department of Beni. Neighbouring human settlements include San Borja. The south boundary runs parallel to the San Borja - San Ignacio de Moxos highway. Maniqui River forms the west boundary and Chirigua Creek the eastern boundary. 14°38'S, 66°18'W

DATE AND HISTORY OF ESTABLISHMENT Established as a biosphere reserve on 5 October 1982, by Supreme Decree 19191 of the Presidency of the Republic of Bolivia. Accepted as a biosphere reserve in October 1986.

AREA 135,000ha

LAND TENURE State

ALTITUDE 220-235m

PHYSICAL FEATURES The geology consists of quaternary alluvial sediments deposited on a thin Precambrian shield. The soils are of low or medium fertility (Cochrane, 1973). This is a lowland system, the first mountain range of the Eastern Sub-Andean foothills is found 50km to the south-west. The land is largely flat, with some poorly drained areas and some higher zones. There are terraced river banks along the Maniqui.

CLIMATE Mean annual temperature is 27°C and mean annual precipitation is 1800mm, both recorded at an altitude of 226m. The dry season lasts from April to October.

VEGETATION Consists of components of *Hylea* of northern Brazil, together with components of the sparse forest of Central Brazil (Cerrado) and Paraguay-Argentina (Chaco). Forest systems represented include: tropical forest, characterised by species such as ochoo *Hura crepitans*, mara *Swietenia macrophylla* and motacu *Athaelea princeps*; gallery forest; forest islands of deciduous trees; lowland dense forest characterised by palo maria *Calophyllum* sp., guayabochi *Calycophyllum spruceanum*, chonta *Acrocomia* sp.; open middle-height forest (5-15m), which forms the transition zone between forest and savanna, characterised by tajibo *Tabebuia* sp., mapajo *Curatella americana*, *Pseudobombax* sp.; matorral formations in the intermediary zones with the open forest characterised by tuzeque *Machaerium* sp.; extensive savannas in the south-east of the reserve and poorly drained lowland zones that support swamp and wetland species. About 1,000 species of vascular plants are estimated to be present.

FAUNA Located in a transition zone between different habitats, the reserve supports a diverse fauna. There are about 100 species of mammals and 300 species of birds in the area. Eighty-nine species of fish have been identified and 26 species of bush amphibians and reptiles. Mammals include bush dog *Speothos venaticus* (V), maned wolf *Chrysocyon brachyurus* (V), marsh deer *Odocoileus dichotomus*, jaguar *Panthera onca* (V), and giant armadillo *Priodontes maximus* (V). Noteworthy birds include greater rhea *Rhea americana*,

peroqui Cathartes melambrotus, harpy eagle Harpia harpyja (R), tapacare Chauna torquata, toucan Ramphastos toco, blue-and-yellow macaw Ara araraunа, green-winged macaw A. chloroptera, chestnut-fronted macaw A. severa, water serer Opisthocomus hoazin, jabiru Jabiru mycteria, maguari stork Euxenura maguari and royal egret Pilherodius pileatus. Among the reptiles are some of the most spectacular species of the Neotropics, including pucarara Lachesis muta, anaconda Eunestes murinus and black caiman Melanosuchus niger (E).

CULTURAL HERITAGE No information

LOCAL HUMAN POPULATION Approximately 20 families of Chimane aborigines live in the reserve. They live mainly along the Curiraba and Maniquisito rivers and are primarily hunter-gatherers and also practise a type of itinerant agriculture. Farmers of surrounding areas exert pressure on the reserve's periphery by setting up cattle ranches and plantations.

VISITORS AND VISITOR FACILITIES The reserve is more accessible during the dry season between April and October. Maniqui River provides access throughout the year, but Curiraba Creek does so only during the rainy season.

SCIENTIFIC RESEARCH AND FACILITIES Scientific research has been treated as a priority since it is the major support to the protection of the area. Ongoing research lies in improving knowledge of unknown tropical areas. The presence of forest ethnic groups makes this reserve an important area for anthropoligical and socio-economic studies. The Beni Biological Station has facilities for meteorological and other research, with accommodation for up to 15 scientists. El Porvenir, ranch adjacent to the reserve, provides for the development of scientific projects in agriculture, forestry and animal husbandry for the benefit of the region.

CONSERVATION MANAGEMENT The dense high forest has been left largely undisturbed due to the difficulty of access. The savanna, however, is used for raising cattle by a limited number of private ranchers. There is some forestry activity, limited to areas along the access routes.

MANAGEMENT PROBLEMS The forests of South America are under severe pressure from settlers who attempt to clear the forest and turn the land to agricultural or stock production. In Bolivia there is a flow of people down from the hills seeking land of their own. Although the reserve is relatively inaccessible, pressures for new land are likely to rise in the future, making protection more necessary.

STAFF Seven, three based in La Paz and four in the field

BUDGET No information

LOCAL ADMINISTRATION Estacion Biologica Beni, av 16 de Julio 1732, Casilla 5829, La Paz

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NAME Forêt Classé de la Mare aux Hippopotames

MANAGEMENT CATEGORY VIII (Multiple Use Management Area) and IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 3.04.04 (West African Woodland/Savanna)

GEOGRAPHICAL LOCATION Lies in Bobo-Dioulasso District, 60km north of the town of Bobo-Dioulasso, which is the second largest town in the country. The reserve is roughly oblong about a north-south axis. The Black Volta, flowing north-east, marks the limit of the reserve on the western side. The eastern limit follows the Bossora/Bala highway. The Wolo River forms the south-west limit. 11°30'-11°45'N, 04°05'-04°12'W

DATE AND HISTORY OF ESTABLISHMENT Bansie, Bambou Kapo, Bahou and the Hippopotamus Pool were gazetted as classified forest on 26 March 1937 by Order No. 836 SE. Accepted as a biosphere reserve October 1986.

AREA 16,300ha

LAND TENURE State

ALTITUDE 300-320m

PHYSICAL FEATURES The land is flat and prone to flooding in the wet season, when the forest becomes inundated and pools linked. The forest is divided into two parts by the River Leyssa, which flows west into the Black Volta. The Mare aux Hippopotames (660ha) flows into the Wolo River, a tributary of the Layessa which joins the Black Volta a further 1km downstream.

CLIMATE The climate is predominately influenced by dry and moist winds originating from the Sahara and South Atlantic, respectively. The dry season lasts for six months, from November to April, and the wet season for 88 days. Mean annual rainfall is 1100mm and mean annual temperature is 28°C at an altitude of 310m.

VEGETATION Generally comprises open forests, rich in species with Guinean affinities. The most common species are Anogeissus leicarpus, Mitragyra inermis, Crataeva adansonii, Nauclea latifolia, Cola cordifolia, Berlinia grandiflora, Deterium microcarpum, Elaeis guineensis, Raphia sudanica, Daniellia oliveri, Hymenocardia acida, Lannea velutina, Parinari polyandra, Albizzia chevalieri and Pterocarpus ericaceus. Further details of the flora are given by Maldague (1986).

FAUNA The fauna is diverse with primates, carnivores, elephant Loxodonta africana (V) and duikers Cephalophus spp. present. The most important species is hippopotamus Hippopotamus amphibius, of which there were 45 in 1981. Hippopotamus pool is an important breeding and nursery ground for fish such as Tilapia spp. The avifauna includes large breeding populations of migratory species. The area is also rich in invertebrates. Further details of the fauna are given by Maldague (1986).

CULTURAL HERITAGE The local people are Bobos, traditionally agriculturalists, together with some Mossi migrants and Peul stock-raisers.

LOCAL HUMAN POPULATION There are five villages (Badema, Bala, Bossora, Paramasso and Sokourani) in close proximity to the reserve. Slash-and-burn agriculture is practised, the main crops cultivated being Pennisetum americanum and Sorgum spp. At Bala, the main activity in the dry season is fishing. Women collect fungi in the wet season.

VISITORS AND VISITOR FACILITIES Tourists visit Ouagadougou and Bobo-Dioulasso to watch hippopotamus.

SCIENTIFIC RESEARCH AND FACILITIES In 1978 the CNRST began preliminary studies of the reserve. The attraction of the forest for education and research lies in the richness of its communities. A list of research projects is given by Magdalue (1986).

CONSERVATION MANAGEMENT A management plan is under preparation (Maldague 1986). The proposed system of zonation comprises a core area to the north of Leyessa River, with three buffer zones to the south-east and north-east. The zone proposed for experimental research will contain the Mare aux Hippopotamus. A training/tourist zone has been proposed but its location is unknown. A zone of influence extending beyond the reserve to surrounding villages is planned. In the south-west of the country, rice is becoming an increasingly important crop and with it the demand for suitable wetland. Thus the status of the reserve as a protected area will become more important.

MANAGEMENT PROBLEMS Uncontrolled dry season burning and traditional slash and burn agricultural practices are the main threats.

STAFF Fifteen, including four administrative and six research personnel

BUDGET No information

LOCAL ADMINISTRATION IRBET/DGRST, BP 7047, Ouagadougou

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NAME Fujian Wuyishan Nature Reserve

MANAGEMENT CATEGORY IV (Managed Nature Reserve)
IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 2.01.02 (Chinese Subtropical Forest) and
2.15.05 (Oriental Deciduous Forest)

GEOGRAPHICAL LOCATION Situated in the north-west of Fujian Province. Towns near the area include Chonjan and Xingtian to the east, Zhaili and Guangze to the west, and Shaouru to the south. 27°35'-27°55'N, 117°24-117°51'E

DATE AND HISTORY OF ESTABLISHMENT Wuyishan Nature Reserve was ratified by the provincial government in April 1979. It was also ratified as a national key nature reserve by State Council in July 1979 and accepted by Unesco as a biosphere reserve in March 1987.

AREA 56,527ha

LAND TENURE State

ALTITUDE 200-2,158m

PHYSICAL FEATURES The geology of the area consists of granite and volcanic rock. Movement of the rock has produced many valleys and cliffs and a general slope of about 40°. The highest point in the area is Huanggang Shan Mountain.

CLIMATE The area experiences the lowest temperatures and the highest precipitation in Fujian Province. Annual temperature ranges from 12° to 18° and annual precipitation ranges from 1400-2100mm. Humidity is high and fog is common.

VEGETATION The area is mainly covered with subtropical evergreen broad-leaf forest, evergreen deciduous mixed forest, coniferous and broad-leaf mixed forest, mountainous coniferous forest, bamboo forest, mountain scrub forest and mountain grassland. A total of 1,804 vascular plant species have been identified, some of which are locally rare, for example, *Ginkgo biloba*, *Tsoonigiodendron odorum*, *Emmonoptorys henryi*, *Tsuga chinensis* and *Eretschneidera sinense*.

FAUNA Species found in the area are representative of both central and southern China. The 100 mammal species identified include stump-tailed macaque *Macaca speciosa* and clouded leopard *Neofelis nebulosa* (V). Of the 234 bird species present, the most notable are Cabot's tragopan *Tragopan caboti* (E), silver pheasant *Lophura nycthemera* and mandarin *Aix galericulata*. The 72 reptile species include *Agkistrodon acutus*, *Naja hannah* and *Bungarus multicinctus multicinctus*. The 32 amphibian species include *Rhacophorus chenfui* and *Straurois chunganensis*. There are 30 fish and about 5,000 insect species.

CULTURAL HERITAGE No information

LOCAL HUMAN POPULATION There are three villages with a total of 2,080 residents in the reserve. The nature reserve administration allows people to plant trees, collect bamboo, gather fungi, manage stock and practice agriculture within the experimental zone.

VISITORS AND VISITOR FACILITIES There are more than 3,000 visitors annually.

SCIENTIFIC RESEARCH AND FACILITIES Research subjects that have been investigated since 1979 include geology, geomorphology, climatology, soil science, geobotany, zoology and microbiology.

CONSERVATION MANAGEMENT The area is divided into two a core area of 44,376ha and an experimental area of 21,180ha. There is no management plan. Interpretation exercises include talks and the Wuyishan Newsletter.

MANAGEMENT PROBLEMS No information

STAFF Eighty-two

BUDGET No information

LOCAL ADMINISTRATION Management Division of Wuyishan Nature Reserve, Chongan County, Fujian Province

REFERENCES

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NAME Fanjingshan Mountain Conservation Area

MANAGEMENT CATEGORY IV (Managed Nature Reserve)
IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 2.01.02. (Chinese Subtropical Forest)

GEOGRAPHICAL LOCATION Situated in the north-east of Guizhou Province, Fanjingshan Mountain is the main peak of the Wuling Mountains. The area includes parts of three counties: Yengjiang, Shontao and Jiangkon. 27°49'50"-28°1'30"N, 108°45'55"-108°48'30"E

DATE AND HISTORY OF ESTABLISHMENT The administrative regulations for Guizhou Province were set in Paper of Government No.(84)78. The administrative measures of forest and wild animals were announced by the State Council in 1985. It is not known when the reserve was first established. Accepted by Unesco as a biosphere reserve in October 1986.

AREA 41,533ha, including 26,667ha core area

LAND TENURE State

ALTITUDE 480-2,570m

PHYSICAL FEATURES The mountain area is part of a large, ancient anticline formed during the Fanjingshan tectonic movement, which lasted 1.4 billion years and produced a diverse, beautiful natural landscape with deep gorges and rock outcrops. The rock is slightly metamorphosed rock of the Proterozoic Erathem. The whole area is remarkably free from pollution. Fanjingshan Mountain is the watershed for the Yuanjain River and the Wujang River. There are nine main streams cutting into the canyon bottom with a radical drainage system coming down from the peak.

CLIMATE Mean annual temperature is 12.2°C and mean annual rainfall is 2535mm at 1200m. Vertical climatic zones may be classified into middle subtropical, north subtropical, south temperate and middle temperate. The south and north-eastern slopes have a lower temperature range and heavier rainfall than the contrasting south, north and west slopes. A temperature inversion level is often observed at 1300-1900 m.

VEGETATION The mountainous habitat, with its wide range in altitude, supports a diverse flora. So far about 3,000 species have been identified. Five zones of vegetation can be distinguished (Researchers, 1982): evergreen broadleaf (up to 1,300m), mixed evergreen-deciduous broadleaf (1,300-1,900m), deciduous broadleaf (1,900-2,100m), subalpine coniferous (2,100-2,350m) and subalpine shrubbery and meadow zone (above 2,350m). Forests cover 80% of the reserve area (Anon., 1982), with hardwood species comprising 89% of the forest cover (Anon., 1982). Hardwood species identified include: chinquapins Castanopsis spach, oak Cyclobalanopsis oerst, beech Fagus spp., hemlock Tsuga carr, hemlock-fir Tsuga chinensis-Abies fargesii, rhododendron Rhododendron spp., maple Acer spp., sorbo Sorbus spp., plum Prunus spp., small bamboo Arundinaria nakai Chinese yew Taxus chinensis, Chinese tuliptree Liriodendron chinensis and Chinese dovetree Davidia involucrata. A total of 151 species of fungi have been identified (Anon., 1982).

FAUNA The dominant faunal components of Fanjingshan Mountain are from the Oriental Realm, as well as many features of the subtropics. Sixty species and subspecies of mammals have been identified including 13 species that are considered rare in China. Species include the golden monkey Rhinopithecus brelichi, tiger Panthera tigris (E), Assam macaque Macaca assamensis, rhesus macaque Macaca mulatta, forest musk deer Moschus berezovskii, tufted deer Elaphodus cephalophus and mainland serow Capricornis sumatraensis. The avifauna includes 128 species of breeding birds, 95 species of resident birds and 33 species of summer visitors. Of these, 4 species are not common, Chinese tragopan Tragopan temminckii, mandarin Aix galericulata, Reeves' pheasant Syrmaticus reevesi and golden pheasant Chrylophus picus. The reserve's herpetofauna belongs to the Oriental Realm; 40 species and subspecies of reptiles belonginging to 24 genera and including 2 locally native species are present. There are 34 species and sub-species of amphibian belonging to 10 genera, with 3 locally native species and 9 of economic value including the frog Microhyla mixtura and giant salamander Megalobatrachus davidianus.

CULTURAL HERITAGE Cultural remains date back to the Ming Dynasty and can be seen in the form of ancient tablets and ruined structures. Ancient temples on the mountain tops are evidence that the area was of religious importance.

LOCAL HUMAN POPULATION There are no towns but a few villages lie within the area. Known activities are agriculture and forestry.

VISITORS AND VISITOR FACILITIES No information

SCIENTIFIC RESEARCH AND FACILITIES Scientific interest in the area dates back to the beginning of the century. A scientific survey was conducted in 1982. Facilities include research and field stations and experimental plots. Medicinal plants have been the subject of several studies over a number of years. Floral surveys in 1958, 1960 and 1981 have led to a general compilation of 413 species, many of which are used in traditional Chinese medicine.

CONSERVATION MANAGEMENT Apart from the landscape value of the gorges, the reserve supports a substantial variety of flora. The vegetation in the core zone consists of primeval forest. The fauna is diverse and includes several locally rare species. The system of zonation consists of core areas totalling 26,667ha in which any form of disturbance is prohibited, a buffer zone of 14,466ha and a tourist belt of 4,000ha. A management plan does exist and the Management Office of Fanjingshan Mountain Reservation is responsible for its implementation.

MANAGEMENT PROBLEMS No information

STAFF Eighty two, including forty two administration staff of whom three are university-trained. Research staff include five university-trained staff and ten technical personnel.

BUDGET No information

LOCAL ADMINISTRATION Management Office, Fangjingshan Mountain Reservation, Shaixinglu, 100, Jiankon, Guizhou

REFERENCES

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DATE 1983, reviewed October 1987

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NAME Xilin Gol Natural Steppe Protected Area

MANAGEMENT CATEGORY IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 2.30.11 (Mongolian-Manchurian Steppe)

GEOGRAPHICAL LOCATION Situated on the Mongolian plateau in Xilin Gol District of the Inner Mongolian Autonomous Region. No information is available describing the boundary of the area. 43°34'N, 116°22'E

DATE AND HISTORY OF ESTABLISHMENT The Decree declaring the area as a Resource reserve and Experimental/Scientific reserve was passed on 19 May 1985. The Decree takes the form of document No. 98(95) and was issued by the General Office of the Inner Mongolian Autonomous Region Government. Accepted by Unesco as a biosphere reserve in March 1987.

AREA 1,078,600ha with a core zone of 1,471ha

LAND TENURE State

ALTITUDE 950-1,506.6m

PHYSICAL FEATURES The topography of the area consists of hills alternating with small basins in a region of extinct volcanoes. The semi-arid region is characterised by rivers that end inland in lakes without reaching the sea. Large lakes in the vicinity include Dalai Nur which is a perennial salt-lake and Oagan Nur which is a freshwater lake. Desert lies between Xilin River and Hulai Tu River. Xilin Gol River flows north through the area, leading to its end in a lake, 50 miles north of the town of Abagnar Qi, which itself is situated to the north of the area.

CLIMATE Mean annual temperature is 10.7°C and annual precipitation range is 326.5-448.9mm at 1,160m.

VEGETATION There are about 625 species of flowering plants, most of them xerophilous with Mongolian elements. The dominant vegetation type is steppe and species include Aneurolepidium chinense, Stipa grandis, S. krylovii, Filifolium sibiricum and Cleistogenes squarrosa. Where the habitat is more sandy species include Picea meyri, Populus davidiana and Ulmus pumila.

FAUNA Species include Mongolian gazelle Procapra picticaudata and rodents, such as daurian ground squirrel Citellus dauricus, daurian pika Ochtona daurica and Mongolian five-toed jerboa Allactaga sibirica. Birds of prey are present among the avifauna.

CULTURAL HERITAGE No information

LOCAL HUMAN POPULATION Within the area there are 1,200 families supporting a population of 9,600.

VISITORS AND VISITOR FACILITIES No information

SCIENTIFIC RESEARCH AND FACILITIES Past surveys have included research on grassland vegetation and fauna. Current monitoring activities include monitoring the water quality of Xilin River.

CONSERVATION MANAGEMENT There are five core areas in which all activities are forbidden. The core areas are as follows: Chagan naubau meadow grassland 500ha), Hueiten Xile meadow grassland (311ha), Haliute plain steppe (500ha), Residual picea meyeri woodland (80ha), and Residual poplar and birch woodland 80ha, Collaberative work has included an international symposium on grasslands in 1985. Scientists and students come yearly to study the grasslands.

MANAGEMENT PROBLEMS No information

STAFF 122, including 20 who are administrative and 102 who are research and technical staff.

BUDGET No information

LOCAL ADMINISTRATION The Management Office, Xilin Gol Natural Steppe Protected Area, Xilin Hot, Inner Mongolia

REFERENCES

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DATE November 1987
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NAME Baconao Biosphere Reserve

MANAGEMENT CATEGORY V (Protected Landscape)
IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 8.39.13 (Cuban)

GEOGRAPHICAL LOCATION Situated 150km from the eastern end of Cuba, the area borders the south coast and includes parts of Santiago Province and Guantànamo Province. The administrative town of Santiago de Cuba is situated 2km west of the biosphere reserve and the coastal towns of Siboney and Daiquiri are situated within the area. 19°52'-20°08'N, 75°16'-75°46'W

DATE AND HISTORY OF ESTABLISHMENT The area forms part of the Gran Parque Nacional Sierra Maestra which was created in 1979 by law No. 27. It was accepted by Unesco as a biosphere reserve in October 1986.

AREA 84,600ha, extending up to 22km inland and following 65km of coastline. This is contained within the Gran Parque Nacional Sierra Maestra which covers an approximate area up to 25km wide along about 250km of coastline.

LAND TENURE State

ALTITUDE The topography rises from the Santiago basin to the west, rises to the Gran Piedra Sierra in the centre of the reserve and slopes down into Guantànamo province to the east (0-1123m).

PHYSICAL FEATURES Although part of the Gran Parque Nacional Sierra Maestra, the area is seperated from the Sierra Maestra mountain range by the Santiago basin. Three topographical zones have been identified within the area: low altitude plateau which runs along the coast from the Santiago basin eastwards into Guantànamo province; Gran Piedra Sierra where the highest land is found; and the Santa Maria de Loreto table, 600m above sea level. The physiography of the area consists of sandstone and agglomerate underlying alluvial valleys, coastal tablelands and foothills (up to 400m) while granitic rocks underlie low mountains (400-1200m). The central area is composed of Paleocene-Eocene volcaniclastic rocks of the Cobre Formation, comprising fragments of travertine and agglomerate, with intercalations of sandstone, travertine and tuff. The complex is cross-cut by large batholithic intrusions, intermediate in composition and consisting of granodiorite and diorite.

CLIMATE Mean annual temperature is 24.7°C and the mean annual rainfall is 700mm at sea level. The northern slope is more humid with annual precipitation of 1,500mm at the highest level. Winds are predominantly from the north-north-east, north-east and south.

VEGETATION The most important formations are coastal and sub-coastal xeromorphic bush forest with an abundance of tree and column cactii; coastal rocky and sandy vegetation; mangroves; rain forest; cloud forest; mesophilic evergreen forest; gallery and pine forest. Oriental, Sierra Maestra and Pancubano species, with phyto-geographic affinity with the Caribbean, Neotropical and Antillean regions, are found here. One hundred and thirty eight endemic species have been recorded, including 12 hepatics and three rare and endangered species: Melocactus acunai, M. harlowii, Trichipteris strigillosa.

FAUNA Some 919 species of fauna, comprising 19 mammals, 60 birds, 29 reptiles, 24 spiders and 787 insects are known to be present. In the biosphere reserve nomination 10 species are mentioned as being threatened but they are not identified. Threatened species believed to exist in the region include: one mammal, the bushy-tailed hutia Capromys melanurus (I), which is confined to scattered areas among the four most eastern provinces, and two species of birds, Cuban sharp-shinned hawk Accipiter striatus fringilloides (R) and Florida everglade kite Rostrhamus sociabilis plumbeus (R).

CULTURAL HERITAGE Zones of historical value connected with armed insurrection and French settlements during the Haitian emigration in the last century are studied and preserved.

LOCAL HUMAN POPULATION The buffer zone of 49,140ha supports a population of 28,000. The largest settlement has 640 inhabitants and 21 villages have more than 200 residents.

VISITORS AND VISITOR FACILITIES Tourism is permitted and there is a recreation centre. There is provision for various student training activities. The Commission of the Environment and Natural Resources has encouraged student activities concerned with the environment and pollution. Transport and guides are provided by the authorities.

SCIENTIFIC RESEARCH AND FACILITIES Baconao has been of interest to scientists for a long time, an important pioneer was the collector Charles Ranstden. Over the last decade more than 80 studies, mostly concerned with the composition and distribution of ecosystems (fauna, flora, vegetation, climate, soil), have been undertaken. The area has various scientific installations, such as meteorological radar, a pluviometric network, satellite tracking, solar energy centre, silviculture study centre, underground laboratory, and a seismological, geophysical and astronomical station. There is a herbarium and wood collection. An ecology station is being built.

CONSERVATION MANAGEMENT It is not clear why the area was nominated as a biosphere reserve, but the area is known to be relatively unspoilt. The Hatibonico Wildlife Refuge lies within the area (Perera and Rosabal, 1986) but information regarding its size and exact location is lacking. A system of zonation has been implemented based on the biological value of areas and human population density. The areas given most protection, including prohibition of all human activity, are those that support primary vegetation. There are four zones: Seccion el Indio, a strip no more than 4 km wide running 40km along the coast from the western end of the coastal boundary and covering an area of 14,200ha ± 150ha; Seccion Morrillo, which runs the remaining distance along the coast but extends furthur inland, up to 12 km, and covers an area of 14,800ha ± 150ha; Seccion Gran Piedra, which contains the highest land and covers 13,300ha ± 150ha; and an unamed zone of 42,300ha ± 150ha which surrounds the Seccion Gran Piedra. A general management plan exists which is intended to encourage the harmonious integration of nature reserves with the construction of roads, hunting, villages and technical and scientific development.

MANAGEMENT PROBLEMS During the last century several North-American companies mined open-cast for iron, as a result of which large areas are devoid of vegetation cover. This coincided with the clearing of mountain forests to make way for coffee plantations set up by the French colonists. More recently during the 1940s large areas were dug up for carbon. Present problems include pressures from livestock and wood clearance. It is not clear what form these pressures take.

STAFF One hundred and forty three people work in the reserve, including five administrators with university education.

BUDGET No information

LOCAL ADMINISTRATION Plan Baconao Esfera de Areas Protegidas, Calle 13 #256 - Vista Alegre, Aptdo. 335, Santiago de Cuba.

REFERENCES

Garrido, O.H. (1975). *Catàlogo de las Aves de Cuba*. Instituto de Zoologia. Havana.

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Perera, A. and Rosabal,P. (1986). Las Areas Protegidas en Cuba. *Flora Fauna Y Areas Silvestres* 2: 13-17.

DATE November 1987
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NAME Cuchillas del Toa Biosphere Reserve

MANAGEMENT CATEGORY Cupeyal del Norte: I (Strict Nature Reserve)
Whole area : IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 8.39.13. (Cuban)

GEOGRAPHICAL LOCATION The reserve is situated in the most eastern region of Cuba and extends over parts of Sagua de Tanamo, Moa, Yateras and Yunque de Baracoa municipalities. The Yunque de Baracoa designated national monument lies 5km to the south-east. The reserve boundaries are to the south and south-west the Toa River; to the north Moa, Arroyon and Jiguani Rivers; to the north-east the coastline; and in the south-east corner the Duaba River. 20°16'-20°35'N, 74°30'-75°08'W

DATE AND HISTORY OF ESTABLISHMENT Protection is based on legislation No.33/81 of 12 February 1981. Accepted by Unesco as a biosphere reserve in October 1986.

AREA 127,500ha

LAND TENURE State

ALTITUDE 0-1,139m

PHYSICAL FEATURES Orographically, the reserve belongs to the Sagua-Baracoa mountain and includes Cuchillas de Moa, Cuchillas del Toa and Alturas de Baracoa. Stratigraphically, the reserve is one of the oldest areas in Cuba, with outcrops of Lower-Middle Jurassic (terrigenous clastic-metamorphic) and Upper Cretaceous (terrigenous clastic, carbonate, volcaniclastic) rocks. Predominant in the area are Mesozoic igneous rocks, both ultrabasic (peridotite serpendinite) and basic (gabbro, dolerite) and those of Paleocene, Oligocene and Eocene periods. From a geomorphological point of view the reserve consists principally of eroded tectonic blocks, which correspond to deeply dissected medium-height mountains between 500 and 700m.

CLIMATE Cuba is affected by the Gulf Stream and the north-east trade winds. The heaviest rain falls in September and October and the hurricane season is between June and November. The reserve experiences an "entermaxerico" equatorial humid climate and an annual temperature range of 23.0-27.5°C. Annual precipitation range is 3,000-4,000mm.

VEGETATION Biogeographically Cuba is a province, with flora specifically related to that of the Amazon. There are more than 2,000 species of vegetation, of which more than 100 are locally endemic (e.g. Calophyllum utile, Aristida pradana, Hemithrinax rivularis, Epidendrum replicatum). Principal types of vegetation are montane rain forest (pluvisilva), xeromorphic matorral (charrascal or brenal) and pine Pinus cubensis.

FAUNA The fauna is probably the richest in abundance, as well as diversity, in Cuba. Amongst the most important vertebrate species are the Cuban solenodon Solenodon cubanus (E), an insectivorous mammal and living fossil. Also present are the bird species: ivory billed woodpecker Campephilus principalis (E), Cuban crow Corvus nasicus, Cuban Amazon Amazona leucocephala leucocephala, and Cuban conure Aratinga euops which is locally endangered. Noteworthy insects include numerous species of insects and representatives of the mollusc genus Polymita.

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Whole area : IX (Biosphere Reserve)

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FAUNA The fauna is probably the richest in abundance, as well as diversity, in Cuba. Amongst the most important vertebrate species are the Cuban solenodon Solenodon cubanus (E), an insectivorous mammal and living fossil. Also present are the bird species: ivory billed woodpecker Campephilus principalis (E), Cuban crow Corvus nasicus, Cuban Amazon Amazona leucocephala leucocephala, and Cuban conure Aratinga euops which is locally endangered. Noteworthy insects include numerous species of insects and representatives of the mollusc genus Polymita.

CULTURAL HERITAGE No information

LOCAL HUMAN POPULATION Rural populations in the area are small, with a population density of between 10 and 30 inhabitants per sq.km.

VISITORS AND VISITOR FACILITIES Tourism is permitted.

SCIENTIFIC RESEARCH AND FACILITIES Surveys of fauna, flora, vegetation, climate, geology and soil have been undertaken. Further work is planned from 1987 to add to the existing knowledge of fauna, flora and ecosystems.

CONSERVATION MANAGEMENT The importance of the area lies in the richness of species that are present, including several nationally threatened species. No management plan exists. Protection is principally directed towards the fauna and forest areas. There are seven core zones surrounded by a buffer zone. Six of them: Cupeyal del Norte, El Toldo, Jaguani, Alto de Iberia, Pico Galan and Rio Toa border each other and cover an eliptical shape 60km by 30km. To the south-east is El Yunque core zone which is separated from the others by the buffer zone along the Toa River. The buffer zone is usually no more than 2-3km wide.

MANAGEMENT PROBLEMS No information

STAFF Totals 35 including forest guards and wardens. Two staff have an university or equivalent education.

BUDGET No information

LOCAL ADMINISTRATION Instituto de Botànica ACC, Calzada del Cerro 1257, Gaveta Postal 20006, Ciudad Habana

REFERENCES

IUCN (1986). 1986 IUCN red list of threatened animals. CMC, Cambridge. 105pp.

Perera, A. and Rosabal, P. (1986). Las areas protegidas en Cuba. Silvestres 2: 13-17.

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DATE October 1987
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NAME Guanahacabibes Peninsular

MANAGEMENT CATEGORY El Veral and Cabo Corrientes: I (Strict Nature Reserves)
Whole area : IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 8.39.13.(Cuban)

GEOGRAPHICAL LOCATION Occupies the extreme west of the Cuban archipelago. It is bounded to the north by the Gulf of Guanahacabibes, to the west by the Yucatan straits, to the south by the Bay of Corrientes and the Caribbean and to the east by the La Fe to La Güira road. 21°46'-22°02'N, 84°10'-84°56'W

DATE AND HISTORY OF ESTABLISHMENT Legislation that protects the area is in the form of Law No. 33/81. Cupeyal del Norte and Jaguani Nature Reserves, which are included in the area, were established on 10 July 1963 under Resolution No.412 in the Gaceta Oficial. The area was accepted by Unesco as a biosphere reserve in October 1986.

AREA 101,500ha

LAND TENURE State

ALTITUDE 0-25m

PHYSICAL FEATURES The karst peninsular of Guanahacabibes is one of the youngest geological areas of Cuba. The area consists of a carsic plain with numerous limestone protrusions known as "dogteeth". The freatic layer lies a few metres below the surface and the region has no mountain "macizos" nor rivers. The rocks in two-thirds of the area are Pleistocene (alluvial muds, carbonates) and the remainder Holocene (reefs, peat and alluvial sediment). The northern part is lowest with swamps and mangroves. In the north is a 60km fringe of marine plain with marshy lakes; in the northeast are swampy fluvio-marine delta plains; the remainder of the reserve includes erosional and depositional marine plains which are somewhat dissected.

CLIMATE Mean annual temperature is 25.9°C and mean annual precipitation is 1,460mm at an altitude of 10m.

VEGETATION The flora has a biogeographical affinity with the Yucatan. Principal types are semi-deciduous forest, swamp and coastal (sandy, rocky and mangrove). Cultivations of tobacco, fruit and pastures are present. More than 500 plant species have been collected. The semi-deciduous forest has the highest degree of endemism in Cuba. Included among the 13 endemics on the peninsular are Byrsonima roigii, Callicarpa roigii, Eugenia roigii, Galactia acuneana, Goerziella minima and Neobracea angustifolia.

FAUNA Notable mammals include Desmarest's hutia Capromys pilorides and prehensile-tailed hutia Capromys prenensilis. Birds include white-tailed dove Columba leucocephala and bee hummingbird Mellisuga helenae. Of reptiles Cuban tree boa Epicrates angulifer (I) and Cuban ground iguana Cyclura nubila (V) and various species of anole Anolis spp. are present. Little is known about the invertebrate fauna.

CULTURAL HERITAGE No information

LOCAL HUMAN POPULATION Population density is low, with less than 10 inhabitants per sq.km and a low growth rate over the last 10 years. Human activities are restricted to fishing and apiculture.

VISITORS AND VISITOR FACILITIES No information

SCIENTIFIC RESEARCH AND FACILITIES Until 1987 no detailed botanical survey had been carried out. Research has been conducted to establish the impact of mammals, especially hutias and spiny "Jibaros", on the environment. In 1987 an integral study of flora and fauna and various ecological studies will be started, with the intention of establishing a more complete picture of the natural resources by 1990.

CONSERVATION MANAGEMENT Vegetation in the reserve is in an unspoilt condition, especially in El Veral and Cabo Corrientes, which have been isolated from human activity since 1963. The core zone of 62,200ha is divided into three sections for scientific study: El Faro (21,500ha), El Veral (18,600ha) and Cabo Corrientes (22,100ha). The unnamed buffer zone of 39,300ha is in the form of a substantial area to the east, but in strips and 'corridors' to the west. This effectively separates the core zones from each other and excludes a 66km strip of south coastline from the core zone. The buffer zone contains the major communication routes and most settlements of the area. The forest is managed within the buffer zone. There are several small settlements within the Seccion el Faro core zone. The activities of the local population are not considered a threat to the reserve. Two wardens are employed to guard El Veral and Cabo Corrientes zones, and guards from the Department of Flora & Fauna of the Ministry of Agriculture also protect the reserve. Protection and scientific work will be increased from 1987 when the management plan will be prepared.

MANAGEMENT PROBLEMS Attention is being paid to identifying destructive activities so that measures can be taken to halt them.

STAFF 24

BUDGET No information

LOCAL ADMINISTRATION Instituto de Ecologia y Sistematica, Calzada del Cerro 1257, Gaveta Postal 20006, Ciudad de La Habana

REFERENCES

IUCN (1986). 1986 IUCN red list of threatened animals. CMC, Cambridge. 105pp.
La Habana (1978). Atlas Nacional de Cuba.
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DATE October 1987
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NAME Middle Elbe Biosphere Reserve

MANAGEMENT CATEGORY IV (Managed Nature Reserve) and IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 2.11.05 (Middle European Forest)

GEOGRAPHICAL LOCATION Steckby-Lödderitzer forest occupies both sides of the middle course of the Elbe River, between Aken and the confluence of the river Saale in Zerbst and Schoenebeck county, Magdeburg District. Dessau-Wörlitzer Cultural Landscape is separate from the nature reserve and is situated east of the town of Dessau and the Mulde River and south of the Elbe River. The village of Wörlitz lies within the cultural landscape. 51°53'N,11°59'E

DATE AND HISTORY OF ESTABLISHMENT Steckby-Loedderitz was established as a national nature reserve by order of the Ministry of Agriculture and Forestry on 3 March 1961. Accepted as a biosphere reserve in November 1979, the area was extended to include Dessau-Woerlitzer Cultural Landscape and was renamed Middle Elbe Biosphere Reserve in October 1986.

AREA 17,500ha: Steckby-Loedderitzer Forest 5,000ha and Dessau-Woerlitzer Cultural Landscape 12,500ha.

LAND TENURE Of the 1979 area of 2,113ha, 90% is owned by the state and 10% by cooperative farms.

ALTITUDE 50-75m

PHYSICAL FEATURES The nature reserve is a forested flood plain with meadow land, part of the site being flooded every year by the River Elbe. The geology of the area consists of Holocene sediments (bottom-land loam) overlaying Pleistocene river-bed sands, dunes and deposits of shifting sand. Sediments range from high-nutrient clays, podsolic brown earths to poor sands.

CLIMATE The mean annual temperature is 8.7°C, mean monthly temperatures range from 0°C in January to 18.5°C in July. The mean annual precipitation is 545mm.

VEGETATION The nature reserve comprises 65% forest land, 9% bogs and lakes, 9% river (Elbe), 9% river-bank area and 8% grassland. The area has extensive pine Pinus sylvestris forest (up to 15m in height) covering dune systems. Hardwood and riverine forests cover 1,500ha with species: Quercus robur, Ulmus carpinifolia, U. laevis, Carpinus betulus, Acer campestre. Wild fruit species include Pyrus achras, Malus sylvestris and Pyrus pyraster with hybrids of the cultivated forms over a ground flora of Stellaria holostea and Polygonetum multiflorum. Representive grassland species include Filipendula hexapetala, Ranunculus polyanthemus, Deschampsia caespitosa, Galium boreale, Silaum silaus, Inula salicina, Peucedanum officinale, Serratula tinctoria, Cnidium dubium, Selinum carvifolia, Lathyrus palustris and Iris sibirica. The species Salvinia natans and Trapa natans have been identified in ox-bow lakes. In total some 50 species are present which are regarded as endangered or rare in the GDR.

FAUNA A total of 39 mammals have been recorded. The reserve is one of the most important breeding sites of the Elbe beaver *Castor fiber albicus*, which has been protected since 1913 and consists of 12 colonies. Breeding bird species include lesser spotted eagle *Aquila pomarina* (in its south-western most breeding area), honey buzzard *Pernis apivorus*, goshawk *Accipiter gentilis*, black kite *Milvus migrans*, red kite *M. milvus*, hoopoe *Upupa epops*, kingfisher *Alcedo atthis*, pintail *Anas acuta*, shoveler *A. clypeata* and Ortolan bunting *Emberiza hortulana*. some 130 bird species breed here and it is an important wintering and passage site for over 100 species. The invertebrate fauna includes *Lucanus cervus*, *Osmoderma eremita* (E) and *Ephesia fulminea*. Pond terrapins *Emys orbicularis* are also present. Records exist for over 20 species of fish; 46 species of *Araneae*, eight of *Opiliones*, 26 *Carabidae*, 25 *Coccinellidae*, 70 *Cerambycidae*, 180 species of *Lepidoptera* and 50 species of *Mollusca*.

CULTURAL HERITAGE No information

LOCAL HUMAN POPULATION There are no settlements in the nature reserve. The village of Wörlitz lies within the cultural landscape.

VISITORS AND VISITOR FACILITIES No information

SCIENTIFIC RESEARCH AND FACILITIES A number of scientific projects have been running for a substantial period of time. Research intended to establish inventories of animal populations has been continuing since 1920, with particular attention to beavers and bird ringing. Experiments in pest control by attracting birds to nesting boxes has been carried out since 1925, supported by the Association for the Protection of Birds. Other ongoing studies include research into the structure and dynamics of lowland forests, soil and vegetation mapping. There are five permanent plots for monitoring changes in structure and dynamics of hardwood forest. Potential activities include protection and management of habitats, waterfowl counts, and long-term studies on the structure and dynamics of forest and grassland ecosystems. Field studies are conducted by the Biological Research Station at Steckby, of the Institute of Landscape Research and Nature Conservation of the Academy of Agricultural Sciences. Between 1973 and 1981 the station has reared over 190 great bustards *Otis tarda* from eggs collected from disturbed nests.

CONSERVATION MANAGEMENT A management plan exists for the development, management and cultivation of the area. The buffer zone is managed according to guidelines established by Magdeburg District Council. The nature reserve covers 3,500ha with a core zone of 400ha (after the extension of the site on 10 December 1981) and 100ha of 'regeneration zone'. The extension approved in October 1986 confirmed a total core area of 400ha, a buffer zone area of 4,600ha and created a 'cultural landscape' area of 12,500ha.

MANAGEMENT PROBLEMS Most forest land is unaltered but *Ulmus carpinifolia* is declining under the impact of graphiosis. Hunting and agriculture are practised in accordance with the needs of nature conservation. There are some shipping activities on the River Elbe and the river is slightly polluted.

STAFF Includes three research workers and two technical staff of the Institute for Landscape Research and Nature Conservation, Halle. Two supervisors are employed by the District Council.

BUDGET No information

LOCAL ADMINISTRATION Rat des Bezirkes Magdeburg, Abteilung Forstwirtschaft - Naturschutz, Olvenstedter Strasse, 4. PSF1, Magdeburg 3010

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Biosphere Reserve nomination submitted to Unesco.

DATE 1983, updated September 1986, October 1987

0358V

MEXICO

NAME Reserva de la Biosfera "El Cielo"

MANAGEMENT CATEGORY VIII (Multiple Use Management Area)
IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 1.10.07 (Tamaulipan)
1.21.12 (Madrean-Cordilleran)

GEOGRAPHICAL LOCATION Lies in the south-east of Tamaulipas State, 120m from the Gulf of Mexico. Settlements close to the area are: Llera to the east, Jaumava to the west and Ocampo to the south. The Rio Guayalejo marks the northern limit of the reserve. The boundary passes through four municipal districts: Gomery Farias, Llera, Juamava and Ocampo. The most important access roads are the Ciudad Mante-Ciudad Victoria Highway to the west and the Jaumava-Ciudad Victoria Highway to the north. 22°55'-23°25'N, 99°05'-99°26'W

DATE AND HISTORY OF ESTABLISHMENT Declared a biosphere reserve by the Tamaulipan State Authority on 13 July 1985 in the Official Bulletin No. 56. The Government approved the programme on 28 December 1985 in the Official Bulletin No. 104. Accepted by Unesco as a biosphere reserve in October 1986.

AREA 144,530ha

LAND TENURE State and local community. A high proportion of land is under common ownership, the "ejidal" system covering 30,958ha.

ALTITUDE 100-2,300m

PHYSICAL FEATURES Terrain rises from the coast in the east to the Sierra Madre Oriental Mountain Range further to the west, which follows a north-south axis, and the Sierra de Cucharas. The mountains consists of rocks of the Cretaceous period that have been eroded to form abrupt relief features and small valleys. Fluvial systems in the area drain into the Rio Guayalejo. The eastern slopes of the area form the sources of the Sabinas and Frio rivers.

CLIMATE Mean annual rainfall is 1350mm and mean annual temperature is 23°C at an altitude of 350m.

VEGETATION Five types of vegetation have been distinguished. On the slopes facing the Gulf, between 200m and 800m, is sub-deciduous tropical forest, representative species including *Bursera simaruba*, *Brossimum alicastrum* and *Enterolobiu cyclocarpum*. Between 800m and 1,400m the vegetation consists of mountain mesophyll forest where holarctic species coexist with tropical species. Between 1,400m and 2,300m the vegetation is pine-oak forest, with *Pinus patula*, *Pinus pseudostrobus* and *Quercus laurina* dominant. On the western slopes there is sub-mountain chaparral and matorral vegetation.

FAUNA Fauna from both the nearctic and neotropical provinces are represented, species include jaguar *Panthera onca* (V), ocelot *Felis pardalis* (V), wild cat *Lynx rufus*, white-tailed deer *Odocoileus virginianus leucurus* (O) and temargate *Margama americana*. Some 255 species of resident birds, 175 of migratory birds, 21 of amphibians, 60 of reptiles and 40 species of bat have been reported.

CULTURAL HERITAGE No information

LOCAL HUMAN POPULATION Within the reserve there is a municipal township and 21 production units (ejidos), with a total population estimated at 2,500. The Government and the Autonomous University of Tamaulipas organise working group meetings for the local population to express their views. The local population is being encouraged to participate in rural development programmes such as apiculture, aquaculture and horticulture.

VISITORS AND VISITOR FACILITIES No information

SCIENTIFIC RESEARCH AND FACILITIES Scientific research over the last 40 years has concentrated on increasing knowledge of the geology and vegetation in this mountain environment. A rural survey is at present being carried out to determine exact demarcations for each type of land tenure. Ongoing projects approved by the State Government are coordinated by the Autonomous University of Tamaulipas. To implement the present programme, two ecological stations and a research and monitoring centre will be created. Present facilities include a research station, field station, experimental plots and accommodation for scientists. A monitoring programme is being conducted by the Secretariat for Urban Development and Ecology (SEDUE).

CONSERVATION MANAGEMENT The area contains extensive portions of forest that show little sign of alteration by man. There are two core areas, the largest one in the north-east, the smaller in the south. Core Area I of 28,694ha includes mountainous mesophyll forests and pine-oak forests, while Core Area II of 7,844ha includes sub-deciduous tropical forests. In these areas no public or private work is permitted, hunting is forbidden and other activities restricted. The remaining 91,998ha is a buffer zone in which forestry and other activities are managed. There is a management plan. A team of six guards and one coordinator is responsible for ascertaining the level of exploitation and illegal extraction of resources. The University of Tamaulipas aims to carry out an interpretative programme with the local population, emphasis being given to ecological awareness and basic agricultural education as a part of development.

MANAGEMENT PROBLEMS Damaging activities that the SEDUE team has been created to monitor include illegal extraction of wild species, poaching, clandestine wood extraction and squatter settlements.

STAFF Fifty nine. Twenty one are administrative staff, twelve of whom are university trained. Thirty eight are research staff, thirty two of whom are university trained.

BUDGET No information

LOCAL ADMINISTRATION Dra en C Sagrario Lavin Flores, Universidad Autonoma de Tamaulipas, Matamoros y Calle 8 Apdo 186, 87000 CD Victoria, Tamaulipas

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DATE October 1987

0509Q

NAME Reserva de la Biosfera de Sian Ka'an

MANAGEMENT CATEGORY II & IX (National Park and Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 8.1.1 (Campechean) and partly 8.15.4 (Yucatecan).

GEOGRAPHICAL LOCATION Situated on the Caribbean coast in the south-east of the country, on the eastern side of the Yucatan Peninsula in the State of Quintana Roo (Municipalities of Cozumel and Felipe Carrillo Puerto). Where possible, boundaries were defined to coincide with natural features. To the east the reserve is bounded by the Caribbean Sea and the barrier reef to a depth of 50m, to the south-east by the junction between the marshes and the semi-evergreen forests, to the south by the boundary of the municipal districts of Felipe Carrillo Puerto and Othon P. Blanco (which coincides with the junction of the catchment basins of the Chetumal and Espiritu Santo Bays). Political boundaries are only found to the north and north-east, defined by the border of the farming cooperatives of Pino Suarez and Chunyaxché. 19°05'-20°06'N, 87°30'-87°88'W

DATE AND HISTORY OF ESTABLISHMENT Sian Ka'an was declared a Biosphere Reserve on 20 January 1986 by the Federal Government, and was accepted as a Biosphere Reserve by the MAB International Coordinating Council in late 1986.

AREA 528,000ha in total, of which some 120,000ha are marine. The core zone of the MAB reserve covers 279,704ha.

LAND TENURE The Federal Government owns 99.8%, the remainder being privately owned.

ALTITUDE From sea-level to a maximum of 10m.

PHYSICAL FEATURES Lopez Ornat (1983) gives a detailed account of the physical features of the Yucatan Peninsula, and of the reserve itself. Much of the reserve lies in a zone of recent origin (Pleistocene), and appears to still be in a transition stage. The reserve lies on a partially emerged coastal limestone plain, and includes coral reefs (part of the extensive barrier reef system which has formed along the eastern coastline Middle America), the marine zone between reef and shore (including two large bays), coastal dunes, mangroves, marshes, and inundated and upland forests. The hydrological cycle is complex, and the water table is permanently close to the surface (never deeper than 8m). As a result, up to 75% of the terrestrial part of the reserve is flooded each year by the end of the rainy season (the dry season figure is 20%). There is little surface running water within the reserve, and water usually filters fairly rapidly through the shallow rendzina and 'saskab' (granular whitish and brittle limestone) soils and the limestone rock to subterranean channels. Due to their hardness, the waters in the reserve are generally very clear. A geological fault crosses the reserve from the south-west to the north-east influencing its topography and hydrology.

CLIMATE The climate, which is tropical with summer rains and occasional cyclones, is described by Lopez Ornat (1983). There are no meteorological stations within the reserve, but data is available from a number of stations within a 25km radius. In Palmas, to the north of the reserve, mean monthly temperature lies between 22°C (January/February) and 27.8°C (May). Mean annual temperature was 25.4°C during the 1961-1980 period, and minimum and maximum temperatures were 4.5°C and 40.5°C respectively. Mean annual rainfall is around 1,128mm (derived from 15 years measurement), and three-quarters of

this falls between May and October with September being the wettest month (mean 208.1mm) and March the dryest (mean 29.4mm). Easterly winds blow almost continuously from May to November, while northerly winds, which may reach 100km/h, blow during the dry season. Mean relative humidity is around 80%. Cyclones may occur between June and October, with a peak occurances in September. Strong marine tornados or 'mangueras' can also occur between May and October, although their action is very limited and brief.

VEGETATION Olmsted *et al*. (1983) describe the following types of vegetation for the reserve: medium altitude semi-evergreen forest; medium and low altitude semi-deciduous forest; low altitude flood forest; tasital (or palm savanna) formation; freshwater and saltwater marshes; petenes (or hammocks); dwarfed mangroves; fringing mangroves; and dunes and keys. More details of the vegetation with list of species are given in Olmsted *et al*. (1983), Cabrera *et al*. (1983) who report 520 species of vascular plants for the reserve, and Espejel Carvajal (1983).

The medium altitude semi-evergreen forest covering about 108,500ha represents the climax in the non-flooded areas, although mature vegetation is scarce in the accessible parts of the reserve due to disturbance. Olmsted *et al.* (1983) list 120 species of trees and shrubs, amongst which common large tree species include *Manilkara zapota*, *Metopium brownei*, *Bursera simaruba* and *Lysiloma latisiliquum*, and in some areas *Brosium alicastrum* and *Mastichodendron foetidissimum*. *Thrinax radiata*, a palm 8-10m high, is the most abundant plant, and *Nectandra coriacea*, *N. salicifolia*, *Byrsonima bucidaefolia*, *Coccoloba* sp. and *Caesalpina gaumeri* are also common. The number of epiphytes and climbers depends on the level of disturbance and age of the forest, and ground cover is also very variable.

The area covered by medium and low semi-deciduous forest is less than that of the evergreen forest (11,700ha). Olmsted *et al.* (1983) list 100 species of tree and shrub, the main species being *Bursera simaruba*, *Lysiloma latisiliquum*, *Manilkara zapota*, *Metopium brownei*, *Piscida piscipula* and *Psidium sartorianum*. The abundance of *Beaucarnea ameliae* and the palm *Pseudophoenix sargentii* are characteristic of these forests. The height of the dominant species in the low/medium forest reaches 14m but is more usually 10-12m, while in the low forest tree heights range 2-9m.

Flood forest is subdivided into low forest with closed canopy, and open canopy tree communities, the latter being found in the lower, wetter areas. Dominant species in the tree community are *Haematoxylon campechianum*, *Bucida spinosa* and *Dalbergia glabra*, with other common species including *Byrsonima bucidaefolia*, *Bravaisia tubiflora*, *Metopium brownei*, *Cameraria latifolia*, *Erythroxylon areolatum* and *Malpiglia lundellii*. *Acoelorraphe wrightii* and *Crescentia cujete* are frequently found in more flooded areas. There are also many epiphytes and 'showy' herbaceous species. In the flooded low forest, dominant species are *Metopium brownei*, *Manilkara zapota*, *Bucida buceras* and *Lysiloma latisiliquum*, and prominant trees reach up to 12m.

Aggregations of the tasiste *Acoelorrhaphe wrightii* (flooded palm) are found scattered in slightly higher areas which are frequently flooded, in the grass marshlands and forming a fringe in the posterior part of the marshlands, or amongst the dry and flooded forests (Olmsted *et al*. 1983). Tasiste can form monospecific 'islands' on patches of dark soil, but where it is common it often associates with *Acrostichum danaeafolium*, *Bucida spinosa*, *Cladium jamaicense*, *Conocarpus erectus*, *Dalbergia glabra*, *Chrysobalanus icaco* and *Thrinax radiata*.

Olmsted *et al.* (1983) describe the grass communities which cover large areas to the south and north of the reserve amongst the mangroves and inland forests (though not in areas of higher salinity). This vegetation type occurs as a mosaic with three intermingled associations dominated by *Cladium jamaicense*, *Schoenus nigricans*, and *Eleocharis cellulosa* respectively. Other species found with these communities are *Cassytha filiformis*, *Ipomoea sagittata*, *Pluchea purpurascens*, *Crinum americanum*, *Fuirena breviseta*, *Dichromena ciliata*, *Eleocharis caribea*, *Bletia purpurea*, *Agalinis* sp. and *Dichanthelium dichotomum*.

Petenes or hammocks, raised wooded islands round or ovoid in shape, emerge from the flooded marshes covering areas ranging from several tens of metres in diametre to more than 1km. Larger petenes may have a central waterbody. These islands are vegetated by aggregations of *Cladium*, *Phragmites australis*, *Conocarpus erectus*, *Bucida* spp., *Crescentia* and *Haemotoxylon*, and the trees *Metopium*, *Ficus* and *Plumeria*, and palms *Thrinax* and *Sabal* up to 12-15m high are also found.

There are extensive areas covered by scattered dwarfed mangroves to the east of the freshwater marshes. Plants cover 35-40% of the substrate, with *Rhizophora mangle* (which may reach up to 2m high) occupying much of this. Soil salinity is high, and during the dry season the ground completely dries, while during the flooding season the thin layer of water can reach temperatures as high as 50°C. In the fringing mangroves, the main arboreal components in order of resistance to salinity are *Rhizophora mangle*, *Avicennia germinans* and *Laguncularia racemosa* and trees have a mean height of about 10m. In drier parts, *Conocarpus erectus*, *Manilkara zapota* and *Thrinax radiata* are also present. Non-tree species are the mangrove fern *Acrostichum daneaefolium* and the climber *Rhabdadenia biflora*.

Coastal dunes are found on the part of the littoral facing the open sea and total 64km from the northern limit of the reserve to Punta Allen and from Punta Hualastoc to Punta Tupac. Due to its closeness to the Caribbean islands there is an affinity with their flora exceptional in Mexico (Rzedowsky, 1978; Espejel, 1983). Some endemics are *Cordia sebestana*, *Metopium brownei*, *Acoelorraphe wrightii*, *Suriana maritima*, *Turinar radiata* and *Tournefortia guaphalodes*. Also present are the exotic species *Cocos nucifera*, *Casuarina equisetifolia* and *Colubrina asiatica*. The introduction and cultivation of coconuts have substituted the natural vegetation on the coastal dunes by about 60% (Espejel Carvajal, 1983). On keys, *R. mangle* is the dominant species and the only one in the smaller keys. Thalassia is found with it on larger keys.

A number of drier areas have been disturbed. Selective felling has affected the mahogany *Swietenia macrophyla*, red cedar *Cedrela odorata*, white cedar *Simarouba glauca*, *Cordia dodecandra*, *Guaicum sanctum*, *Metopium brownei* and *Thrinax radiata*. Man-induced fires for agriculture have affected at least 14,000ha of which only 2,000 are in use. These areas are mainly found on both sides of the main road.

FAUNA Garcia Salazar (1983) gives a preliminary checklist of the various vertebrate species found in the reserve, and it is possible that all vertebrate species characteristic of the Yucatan region occur. Twenty-eight species of mamal have been recorded including five species of cat, jaguar *Panthera onca* (V), puma *Felis concolor*, ocelot *F. pardalis* (V), margay (or tigrillo) *F. wiedii* (V) and jaguarundi *F. yagouaroundi* (I), Central American tapir *Tapirus bardii* (V), Caribbean manatee *Trichechus manatus* (V), spider monker *Ateles geoffroyi* (V), howler monkey *Alouatta villosa* (I), kinkajou *Potos flavus*, white-tailed deer *Odocoileus virginianus*, red brocket *Mazama*

americana, the peccaries *Tayassu pecari* and *T. tajacu*, *Agouti paca*, tayra *Eira barbara* and collared anteater *Tamandua tetradactyla*. One hundred and nineteen species of bird are listed by Garcia Salazar (1983), however it is estimated that the number of species occuring is nearer 350, with some two-thirds breeding inside the reserve. Due to the great diversity of aquatic habitats, marine and wading birds are well represented, and there are at least 16 species of raptor. Forty-two species of amphibian and reptile have been recorded within the reserve (Lopez Jurado, 1982), including green turtle *Chelonia mydas* (V), hawksbill turtle *Eretmochelys imbricata* (E), loggerhead turtle *Caretta caretta* (E), and leatherback *Dermochelys coriacea* (E), four of the six species occuring on Mexican coasts, and the crocodile species *Crocodylus moreletii* (E) and *C. acutus* (E). Other species include *Ctenosaura similis*, *Basiliscus vittatus*, *Thecadactylus rapicaudus*, *Boa imperator*, *Crotalus durissus*, *Bothrops asper*, *Bufo valliceps*, *Hyla stauffery*, *H. microcephala*, *H. loquas* and *Leptodactylus melanonotus*. Fish are abundant, and over 52 species have been recorded (Espejel, 1983). Zunino (1983) gives a preliminary evaluation of the invertebrate fauna reported from the coastal mangrove areas, and Gutiérrez Diaz and Canul Gonzalez (1983) give a preliminar report on the insects found in maize.

CULTURAL HERITAGE The reserve is located in the least developed part of the State of Quintana Roo, and the population is of predominantly Mayan origin practising subsistence agriculture and fishing (César Dachary and Lopez Ornat, 1983). Twenty-three Mayan sites have been registered in the reserve, while Tulum, one of the most visited of Mexico's archaeological sites, the Chunyaxché ruins, Vigia del Lago and Xamach, are just to the North. Recently a 24km long Mayan artificial canal was discovered.

100 plant species represented in the reserve are used by the Maya.

LOCAL HUMAN POPULATION There are reported to be some 556 inhabitants (principally of Mayan descendent) living within the reserve. About 340 people live in the settlement Colonia Javier Rojo Gomez on Punta Allen, and a further 40 at Colonia Punta Herrero. Most of the rest (about 100) live in settlements ('rancherias') scattered on the coast and in the forest. Most inhabitants depend on fishing (and in particular lobster fishing), and there are some 75ha of maize fields, 1,352ha with livestock, and 760ha with copra (César Dachary and Lopez Ornat, 1983). There are also three manned lighthouses within the reserve, and a number of hotels and other tourist facilities.

VISITORS AND VISITOR FACILITIES Tourism began to develop around the 1970s when the Tulum beaches to the North started to attract foreign visitors, and visitor facilities have extended southwards, despite the lack of basic services, as trailer parks and rustic huts. However use of the area by tourists would appear to still be low, probably because of difficulty of access, isolation, and the lack of facilities (including good supplies of electricity and drinking water). Facilities throughout the reserve are restricted to the coastal strip. In the North this consists of a small hotel (Hotel Pez Maya), the Boca Paila fishing club, and three areas for trailers and 'cabins', while elsewhere within the reserve there is only the small hotel and cabin area at Punta Pajaros. The northern sites can be reached by dirt track from Tulum, while Punta Pajaros is only accessible by boat or aeroplane.

SCIENTIFIC RESEARCH AND FACILITIES Scientific research is directed towards basic science and application to the management and conservation of natural resources. Research in the area is coordinated by the Centro de Investigaciones de Quintana Roo (CIQRO), and extensive surveys have been carried out on the different aspects of its wildlife, ecology, geology and hydrology (CIQRO, 1983). A team from the University of Mexico is currently evaluating the marine resources. There is lodging available for visiting scientists. To date there have been few meterological records from the reserve itself, but two climatological stations have now been donated by the National Metereological Service (SARH).

CONSERVATION MANAGEMENT It has been suggested that Sian Ka'an is the largest effective nature reserve in Mexico, and the area has support at all government levels (municipal, state and federal). The decree in fact makes provision for a council involving the local community, a government coordinating committee and a technical research committee. A management plan has been drafted and is currently being revised. The plan is comprehensive and provides for the zoning of the reserve for different management purposes. A private foundation, Amigos de Sian Ka'an, which consists of dedicated local people, is carrying out studies funded by the WWF.

MANAGEMENT PROBLEMS A particular concern is the development of tourist facilities in the north of the reserve. At present there is a 68km long coastal belt planted mainly for copra, with 25 small farms ('ranchos'). Forest exploitation is limited to the collection of useful wild plants and hunting for subsistence, although there is some commercial and sport hunting which should be regulated. Timber is also exploited with valuable species such as mahogany, cedar, 'siricote' and 'guayacan' becoming nearly exahusted through overexploitation. The chit *Thrinax* is a species much in demand for use in the construction of lobster traps. There may also be some impact from fishing, but the extent of this is unclear (although it is aparent that some lobster poaching continues).

STAFF A director with a staff of 26, 16 of whom are qualified.

BUDGET Government support is supplemented by funding from WWF-US to support protection of the area and some construction costs (to facilitate research).

LOCAL ADMINISTRATION Secretaria de Desarrollo Urbano y Ecologia (SEDUE); Centro de Investigaciones de Quintana Roo, A.C., Puerto Morelos, Quintana Roo.

REFERENCES

All the references to be found in this account are papers in a single treatise on Sian Ka'an:

CIQRO (1983). *Sian Ka'an: Estudios Preliminares de una zona en Quintana Roo propuesta como Reserve de la Biosfera* Centro de Investigaciones de Quintana Roo, A.C., Puerto Morelos.

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DATE June 1987

0504Q

NAME Waddenzee State Nature Reserve

MANAGEMENT CATEGORY Designated Nature Reserves: Boschplat (4400ha), Dollard Kwelder en Wad (4320ha) I (Strict Nature Reserve), The whole area is designated as IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 2.09.05 (Atlantic)

GEOGRAPHICAL LOCATION Lies in the provinces of Noord-Holland, Friesland and Groningen (about 80-200km NNE of Amsterdam). With the exception of the Lauwersmeer area, the boundary of the biosphere reserve coincides with the border of the "Planologische Kernbeslissing" (PKB) (Physical planning Key Decision) in which the governments policy with regard to the Waddensea has been laid down. The boundary follows the seaward toes of the main dykes. In places where there is no barrier the boundary includes all forelands which are innundated by high tide at least once in every two years. This policy means that the boundary does not neccessarily coincide with existing nature reserves. The Lauwersmeer area covers an area of estuary on the north coast of the mainland. 52°52'-53°33'N 04°45'-07°13'E

DATE AND HISTORY OF ESTABLISHMENT Parts of the area are protected under the Nature Conservancy Act 1967, under which the following decrees have been passed:

8 November	1974	Boschplaat, Terschelling	4,400ha
23 May	1977	Dollard Kwelders en Wad	4,320ha
19 October	1978	Staatsnatuurreservaat De Dollard	1,005ha
18 May	1981	Staatsnatuurreservaat De Waddenzee	101,000ha
23 July	1982	De Schorren en Vlakte van Kerken, Texel	6,700ha
23 July	1982	Kwelders Noordkust Friesland	670ha
22 July	1982	Kwelders Noordkust Groningen	1,220ha

Virtually the whole area (250,000ha) was accepted as a wetland of international importance under the Ramsar Convention on 2 May 1982. Areas declared "Staatsnatuurreservaat" are state owned areas. The area of the Lauwersmeer protected for nature (4,300ha) has been designated as "Grote Eenheid Natuurgebied" (GEN) (Large Nature Area Unit); the legal basis of this designation is, however, rather weak. Accepted as a biosphere reserve in October 1986.

AREA Total area 260,000ha, core area 120,000 ha

LAND TENURE Of the core area, 107,000ha are state property and the remaining 13,000ha are private property. Nature conservation societies own and/or manage 11,000ha of the private property, including; the Dollard estuary, Kwelders Noordkust Friesland and Kwelders Noordkust Groningen. Among the private landowners is Natuurmonumentum, a non-governmental nature conservation organisation that manages about 12,000ha in and around the Waddensea including large parts of the Dollard, the island of Griend, reserves near the Lauwersmeer and on the islands of Tessel and Terschelling.

ALTITUDE 0-20m

PHYSICAL FEATURES The Waddensea is a shallow coastal sea, partly estuarine in character. It is protected from the North Sea by a chain of islands and high sand flats. The Waddensea consists of tidal channels and shallow open water (about 45% of the area), muddy and sandy tidal flats (about 45%) and salt marshes (about 10%). The most eastern part of the Dutch Waddensea is marked by the estuary of the Ems River .

CLIMATE Conditions are Atlantic with a mean annual temperature of 9.1°C and mean annual precipitation of 720mm at sea level.

VEGETATION The salt marshes are covered with halophilous vegetation with some 30 species of phanerogams. Transitional areas between marshes and dunes support a further 100 species. The tidal flats support only two species of seagrasses but dozens of species of macro-algae and hundreds of micro-algae. Very little vegetation grows in the tidal channels.

FAUNA The tidal channels and flats support an assembly of invertebrates (e.g. zooplankton, bivalves, polychaetes, crustaceans). These animals form the staple food for numerous species of fish and birds. The Waddensea acts as a nursery for many fish species, including species caught commercially in the North Sea. Breeding species of birds include: shelduck Tadorna tadorna, eider Somateria mollissima, oystercatcher Heamatopus ostralegus, avocet Recurvirostra avosetta, Kentish plover Charadrius alexandrinus, terns Sterna spp., marsh harrier Circus cyaneus, Montagu's harrier Circus pygargus, spoonbill Platalea leucorodia, pintail duck Anas acuta and sandwich tern Sterna sandvichensis. The Wadensea is a very important migratory route for waterfowl. The number of birds present at any one time may total about 1 million. The only mammal species in the area is the Harbour seal Phoca vitularia. A few localities in the neighbouring fens and marshes of Friesland and Overijssel provide the only mainland European habitat for the subspecies of the rare large copper butterfly Lycaena dispar batavus.

CULTURAL HERITAGE Traditional uses of the Waddensea include fishing and culture of shellfish.

LOCAL HUMAN POPULATION Land adjacent to the Waddenzee supports an agricultural community. Towns such as Harlingen employ people in industry and increasingly in tourism.

VISITORS AND VISITOR FACILITIES The region attracts a substantial number of tourists. Visitor activity is mainly limited to the edges of the reserve. Facilities for visitors include camp sites. Service industries have developed.

SCIENTIFIC RESEARCH AND FACILITIES The Waddensea has been the site of scientific research for at least 100 years. In 1985 about 50 scientists conducted research in the Waddensea area. It is expected that such research effort will be maintained in the future. Located very close to the area are two research laboratories, three field stations and a number of shelters. There is accommodation for 40 scientists. The effects of harvesting of lugworms Arenicola marina has been investigated by Van den Heilgenberg (1987).

CONSERVATION MANAGEMENT Management programmes include the Waddensea Conservation Programme (WWF Project 1411) which operates through the IUCN/WWF Advisory Committee for the Waddensea. The Committee outlined a strategy for the area, developed a long-term programme for identifying priorities and provided recommendations on critical conservation issues in order to maintain and improve the status of the area. Projects are funded by the three national WWF organizations concerned (Denmark, Germany and the Netherlands).

The Waddensea is a vital stop over for waterfowl on the Western Palearctic migration route. Together with its rich breeding populations of birds and seals this makes the Waddensea the single most important wetland in Western Europe (IUCN 1987). The future of the area as habitat for birds depends on maintaining the productivity of the area as a food source. Van den Heilgenberg, (1987) considered the present level of harvesting lugworm as not enough to be detrimental to the food levels available to bird populations. More concern was raised over the disturbance to feeding birds that the presence of people digging for lugworm causes, some areas are now permanently unsuitable for feeding birds despite supporting an available food source. There is a management plan for the reserve. Wardens and other government officials are responsible for controlling human activities such as fisheries, recreation and sand extraction. The most active management is carried out in the coastal areas of salt marsh and dunes. Very vulnerable parts of the reserve e.g. breeding colonies of birds and seal resting areas which together comprise 10% of the area, are afforded strict protection. In the remaining part of the core area, fishing and recreation are permitted unless such activities threaten the integrity of the area. Outside the core area other activities such as sand extraction and mussel culture are allowed, subject to safeguards.

MANAGEMENT PROBLEMS The greatest ecological threat is declining water quality. Pollution comes in the form of waste water, heavy metals, pesticides and polychlorinated biphenyls. Contamination by such pollutants threatens to kill birds and reduce the reproductive rate of seals. Military training occupies areas of land, for example the Marnewaard training area is adjacent to the Lauwersmeer area. Other disturbances are fishing, mussel culture, sand extraction, exploitation of petroleum and engineering works for coastal protection. The area is affected by mass recreation and other tourist activities. Some reserves are closed to the public. Measures are being taken to restrict the number of breeding pairs of herring gull Larus argentatus.

STAFF One hundred and eight staff, including 12 research staff

BUDGET WWF Expenditure on Waddensea Conservation Programme (Project 1411) 1984/85 - $2,523 (Total since 1977 - $492,080)

LOCAL ADMINISTRATION Staatsbosbeheer, Engelsekamp 6, 9722 AX Groningen

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DATE September 1987

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NAME Lake Torne Area

MANAGEMENT CATEGORY Storlands Nature Reserve - I (Strict Nature Reserve), Abisko Scientific Research Station Nature Reserve - I (Strict Nature Reserve), Abisko National Park - II (National Park), Vadvetjakka National Park - II (National Park), IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 2.06.05 (Subarctic Birchwoods)

GEOGRAPHICAL LOCATION Situated in the northernmost part of Sweden. The northern boundary follows the border with Norway, while the southern boundary follows the south bank of Lake Torne, extending to include the Vadvetjakke National Park, Abisko National Park, Abisko Scientific Research Station Nature Reserve and Stordalens Nature Reserve. 68°25'N, 19°00'E

DATE AND HISTORY OF ESTABLISHMENT The individual nature reserves and national parks were created between 1909 and 1980. Accepted as a biosphere reserve in October 1986.

AREA The biosphere reserve covers 96,500ha and includes: Abisko National Park (7,500ha), Vadvetjakka National Park (2,500ha), Stordalens Nature Reserve (1,000ha), Abisko Scientific Research Station Nature Reserve (500ha) and Lake Torne (25,000ha out of a total area of 31,700ha).

LAND TENURE State

ALTITUDE 340-1,610m

PHYSICAL FEATURES The area consists of mountainous features to the west, dominated by outcrops of bedrock, and to the north where there are higher mountain massifs. Lake Torne lies along a north-west axis, it was formed as a result of glacial excavation and is extremely oligotrophic. The area includes alpine and subalpine zones, areas of barren rocks as well as alpine meadows, valleys, mountain slopes, lakes and watercourses. Karst-phenomena with caves occur in the limestone bedrock north of Lake Torne.

CLIMATE Mean annual rainfall ranges from 1500mm in Vadvetjakka National Park to only 300mm per year in Abisko National Park (a very low figure for Sweden).

VEGETATION Extensive areas (of the land) are covered with different types of birch forest. There are alpine and subalpine heaths and meadows. Due to the calcareous soil, the flora is locally very rich. There are wetlands north of the lake which vary from rich fens to poor swamps. The flora of the Abisko area is of particular interest, with rare species such as *Platanthera oligantha*, *Epipogium aphyllum* and *Milandrium apetalum* present.

FAUNA Domesticated reindeer *Rangifer tarandus* are found throughout the whole area. Common animal species also include moose *Alces alces*, wood hare *Lepus timidus*, ermine *Mustela erminea*, pine marten *Martes martes* and several species of small rodents. Rare mammal species are brown bear *Ursus arctos*, lynx *Lynx lynx*, wolverine *Gulo gulo*, arctic fox *Alopex lagopus* and otter *Lutra lutra*(V). Typical bird species in the region are dotterel *Charadrius morinellus*, golden plover *Pluvialis apricaria*, long-tailed skua *Stercorarius longicaudus*, rough-legged buzzard *Buteo lagopus*, merlin *Falco columbarius*, red-necked phalarope *Phalaropus lobatus*, Temminck's stint *Calidris temminckii*, willow grouse *Lagopus lagopus* and ptarmigan *Lagopus mutus*. Rare birds include gyr falcon *Falco rusticolus*, golden eagle *Aquila chrysaetos*, shore lark *Eremophila alpestris* and arctic warbler *Phylloscopus borealis*.

CULTURAL HERITAGE The area has been used by Lapps for grazing reindeer for several centuries. Traditional activities also include hunting and fishing.

LOCAL HUMAN POPULATION Traditional Lapp farming has been modified with the use of off-road vehicles. The Lapps lead less of a nomadic life than they used to. Revenue generated by visitors to the protected areas and from hunting and fishing has contributed to the local economy.

VISITORS AND VISITOR FACILITIES The number of visitors to a particular area depends on accessibility. The area north of the lake is largely without roads and, as off-road driving is forbidden, few tourists visit the area. To the south of the lake though, there is a railway and roads that provide good access. Abisko National Park has about 30,000 visitors a year. Facilities here are good and attract tourists throughout the year. During the winter visitors are attracted by the skiing, facilities for which include a cable transport line. During the summer the area is widely used by hikers along marked trails. Other facilities include a tourist station (where overnight accommodation is available), bridges, overnight cabins and an information centre.

SCIENTIFIC RESEARCH AND FACILITIES The Abisko Scientific Research Station was established in 1903. Consequently, this area of Sweden has been studied over a long period, providing a comprehensive understanding of the area. Ongoing studies concern the effects of tourism on the environment. Within the Abisko area, monitoring of terrestrial and limnological ecosystems forms part of the National Monitoring Programme in Sweden.

CONSERVATION MANAGEMENT The long history of scientific research and preservation of the areas in their natural state are the main reasons for creating a biosphere reserve. Regulations applied in the two national parks and two nature reserves are stricter than elsewhere. These four areas, totalling 110,500ha, are regarded as core areas by the Swedish Environmental Protection Board. The delta of Abiskojakka River within Abisko National Park is protected as a bird sanctuary and access is prohibited from 1 May to 31 July. Reindeer husbandry is considered fully compatible with the purposes of the biosphere reserve.

MANAGEMENT PROBLEMS There are few management problems in the area. Resource exploitation is not allowed without the permission of the Swedish parliament. The important areas, such as nature reserves, are protected by limiting access. It is not yet known how much of a threat off-road vehicles will prove to be.

STAFF Fourteen, including wardens and rangers. The number of permanent personnel at the Abisko Scientific Research Station is ten.

BUDGET No information

LOCAL ADMINISTRATION Warden, Asgaton 20, 960 40 Jokkmokk

REFERENCES UNESCO Nomination

DATE October 1987

1382V

NAME Tsentralnosibirskii State Nature Reserve

MANAGEMENT CATEGORY I (Strict Nature Reserve) and IX (Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 2.03.03 (West Eurasian Taiga) and 2.04.03 (East Siberian Taiga)

GEOGRAPHICAL LOCATION The Reserve lies in Krasnoyarsk Territory and extends over two regions: the eastern part of West Siberian Lowland (Zapadno-Sibirskaja Nizmennost) and the western provinces of the Central Siberian Plateau (Sredne-Sibirskoje Ploskogorje). The boundary does not follow any topographical feature in the west, but in the east it curves to include some of the catchment area of Podkamennaya River. 60°55'-63°15'N, 84°15'-92°30'E

DATE AND HISTORY OF ESTABLISHMENT Created a State Nature Reserve by the Council of Ministers of the Russian Soviet Federated Socialist Republic Decree of 9 January 1985. Accepted as a biosphere reserve in October 1986.

AREA Total area 5,000,000ha. Strict Nature Reserve of 972,017ha constitutes the core area.

LAND TENURE State. In January 1985, 682,054ha of forestland was removed from the tenure of Nizhne-Eniseikii Forestry Unit and 289,963ha of forestland was removed from the tenure of Turukhanskii Forestry Unit to be managed as the reserve area.

ALTITUDE 80-500m

PHYSICAL FEATURES The reserve is divided from south to north by Yenisey River, with Siberian lowland to its west and higher ground (Siberian Plateau) to its east. The glacial plain in the west is characterised by swamps and slow rivers, while to the east rivers are steep and swift. The basin of Podkamennaya Tunguska River is characterised by precipices, cliffs, rapids and waterfalls.

CLIMATE A mean annual temperature of -5.8°C and mean annual precipitation of 500m has been recorded at an altitude of 150m within the nature reserve.

VEGETATION In view of its wide range of physical features, all taiga ecosystems characteristic of Central Siberia are represented in the reserve. The flora is typical of the middle taiga sub-zone. *Pinus sibirica* and *Larix* spp. predominate. *Picea* spp., *Abies* spp., *Pinus* spp., *Betula* spp. and *Populus tremula* are also common. There are about 700 species of vascular plants, representative of 73 families, in the core area of the reserve, including some endemics and relicts.

FAUNA The reserve is important for taiga species. There are 40 species of mammals including sable *Martes zibellina*, elk *Alces alces*, bear (Ursidae), badger *Meles meles* and lynx *Felis lynx*. 237 species of birds (including 137 breeding species) are represented. The reserve also supports two species of reptiles, four of amphibians and twenty nine species of fish.

CULTURAL HERITAGE The harsh climate of Siberia has always limited man's development in the region. While man's impact has been small, there has been a long tradition of hunting and fishing in the area.

LOCAL HUMAN POPULATION The core area is totally free from modification by man. Territory to the south of the core area is inhabited by the Kets, whose main occupations are hunting and fishing, while to the north live the Evenks. Their main occupations are hunting and reindeer husbandry. The rest of the reserve is inhabited by Russians, most of whom have lived in the area for generations. Their occupations, besides hunting and fishing, include forestry and agriculture. Such activities are patchily distributed.

VISITORS AND VISITOR FACILITIES No information

SCIENTIFIC RESEARCH AND FACILITIES Integrated ecological research on soil, vegetation and animal populations has been conducted in the core area since 1969 by the Institute of Evolutionary Animal Morphology and Ecology of the U.S.S.R. Detailed inventories of flora, fauna and soil are the first priority in the reserve's research programme.

CONSERVATION MANAGEMENT The reserve is an important conservation area because it contains representatives of all taiga ecosystems for Central Siberia. Its unspoilt nature makes it ideal for species and ecosystems research. Yenisey Valley is one of the major flyways in the Eastern Palaearctic. Some avian species have been listed in the USSR Red Data Book. Seventy species of plant including Botrychium lunaria, Selaginella selaginoides, Brachypodium pinnatum, Elymus jenisseensis, Lilium pennsylvanicum, Cypripedium macranthum and Oxytropis katangensis, have been proposed for strict protection. The reserve has a core area of 972,000ha, within which any form of development is totally prohibited, a buffer zone of 150,000ha, a research zone of 120,000ha, which lies alongside the north-west corner of the core zone with Yenisey River flowing through it, and traditional taiga land with an area of about 4,000,000ha. The taiga, is used for traditional activities (hunting, fishing, reindeer husbandry) and contains relatively restricted zones for forestry and agriculture. The core area includes 60km of the Yenizey Valley.

MANAGEMENT PROBLEMS No information

STAFF 118 staff, including administrative and research workers

BUDGET No information

LOCAL ADMINISTRATION Tzentralnosibirskii State Nature Reserve, 663196 Bor (Turukhansk, Krasnoyarsk)

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DATE September 1987
1376V

Carolinian-South Atlantic Biosphere Reserve: Santee Delta-Cape Romain Subregion

MANAGEMENT CATEGORY I, V, VI and IX (Strict Nature Reserve, Protected Landscape, Resource Reserve and Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 1.06.05 (Austroriparian)

GEOGRAPHICAL LOCATION The reserve is bordered on the east by the Atlantic Ocean, on the west by the Intracoastal Waterway, on the north by the northern boundary of Hobcaw Barony,(previous to the extention the northern boundary was the North Inlet estuary) and on the south by Capers Inlet. The entire reserve is included in two counties, Charleston and Georgetown. It is approximately 20 miles north-east of the city of Charleston and approximately 10 miles south-east of the city of Georgetown. Across the Intracoastal Waterway to the west is the Frances Marion National Forest. 33°07'N, 79°20'W.

DATE AND HISTORY OF ESTABLISHMENT Cape Romain Refuge: established, excluding Bulls Island, in 1932. Closed to migratory bird hunting by Presidential Proclamation 2000. Bulls Island was added to the refuge in 1936. Wilderness Area established and protected by Public Law 93-632 dated 1.3.75. Yawkey Wildlife Centre: became state land under Carolina Heritage Trust Agreement and Easement Act No. 600 in 1976. Santee Coastal Reserve: ownership went to the state of South Carolina from The Nature Conservancy 9.20.74. Washoo Reserve: the title has been retained by The Nature Conservancy. Capers Island: became state owned in 1975 with Bureau of Outdoor Recreation funds. Hobcaw Barony: is privately owned by the Belle W Baruch Foundation and is protected under a legal trust for conservation, research and for educational purposes. Accepted in 1986 by Unesco as a biosphere reserve; on 25 March 1987 the area was extended by increasing the area of the Cape Romain Refuge and including Hobcaw Barony.

AREA The total area is 47,992ha (increased from 32,474ha). Different units consist of: Washoo Reserve - 421ha, Yawkey Wildlife Centre; North Island - 1,821ha and South Cat Islands - 6,659ha, Cape Romain Refuge - 22,294ha, Capers Island - 809ha, Santee Delta Reserve - 8,906ha and Hobcaw Barony - 7,082ha.

LAND TENURE The state owns 22,294ha in the form of US federal lands under the Fish and Wildlife Service. The state of South Carolina owns 16,374ha and 1,821ha of the core zone. The Nature Conservancy owns 421ha in the core zone. The remaining 7,082ha of the core zone are owned by the Belle W Baruch Foundation.

ALTITUDE 0-12.8m

PHYSICAL FEATURES Located in the lower coastal plain in the Carolinian-South Atlantic region. The unit contains representative communities of the region, as well as unique features. It includes nine contiguous barrier islands, a true embayment (Bull's Bay), cuspate foreland (Cape Island) and seven major estuaries (North Inlet, Winyah Bay, and North and South Santee Rivers). There are extensive salt marshes, with numerous inlets and small islands; areas of impounded marsh for rice culture are also present. Pleistocene sediments compose the core of the barrier islands formed in response to sea level rise. Tides are in the mesotidal range with numerous tidal inlets, extensive salt marshes, beach ridge barrier islands with maritime forests. Special features include: significant river delta on the Atlantic coast of the U.S., a true embayment, cuspate foreland, and extensive impoundments.

CLIMATE The mean annual temperature is 19°C and the mean annual precipitation is 1320mm.

VEGETATION Commonly found species: Salt Marsh - smooth cordgrass, and saltmeadow cordgrass. Dune community - sea oats, panic grass, sandspur, beach pennywort, brown sedge, prickley pear, cabbage palmetto, wax myrtle. Transition and shrub communities - wax myrtle, yaupon holly, red bay, eastern red cedar, live oak, catbrier, pepper vine, trumpet vine, Virginia creeper, sea myrtle, sea ox-eye, black needlerush. Maritime forest - live oak, laurel oak, cabbage palmetto, magnolia, loblolly pine, southern red cedar, yaupon holly, red bay, and American holly. Other communities also include bald cypress-tupelo, gum swamp, and pocosins. Threatened plants include Sarracenia rubea and Dioneae muscipula. A species list is available for the unit.

FAUNA A species list is available for the unit

CULTURAL HERITAGE Apart from some cultivation of rice in the 1800s, there has been very little development. The North Island lighthouse was listed as a National Historic Landmark on 30 December 1974.

LOCAL HUMAN POPULATION There are 14 family dwellings on the entire reserve. All roads are dirt, and buildings have been kept to a minimum.

VISITOR FACILITIES Cape Romain Refuge: There is a new visitor contact station with various exhibits depicting refuge wildlife, informational pamphlets and species lists. Yawkey Wildlife Centre: Weekly educational field trips for 14 persons available. Graduate student field trips as requested. Inspection of prototype management activities as requested. Cape Romain Refuge: Nature trails for hiking. Santee Coastal Reserve: Nature trails and broadwalks. Hobcaw Barony: Bellefield Nature Centre contains exhibits and provides instructional programmes on the history of the Hobcaw Barony, coastal ecosystem, and the sites activities. The Belle W Baruch Foundation sponsors short courses, coastal ecology classes, teacher workshops, field studies for interested groups and guided tours of the site.

SCIENTIFIC RESEARCH AND FACILITIES Waterfowl related research, impounded and unimpounded marsh ecology, forest wildlife research, endangered species ecology, and coastal wilderness research are major activities. Experimental impoundments with individual water control structures were available with much base line information already collected. Access restricted by ferry operation on Yawkey Centre. The area is important in coastal process and geology since the diversion of the Santee River in 1940 and the scheduled redivision in the near future. Many of the islands and areas are boat access only. All local populations are monitored to some degree. There is especially detailed monitoring of populations of endangered and threatened species. Loggerhead turtles, bald eagles Haliaeetus leucocephalus, osprey Pandion haliaetus, red-cockaded woodpecker Picoides borealis as well as game species. The scientific facilities available in the unit include a field station, experimental plots and four small dorms on Yawkey and one on Cape Romain. Hobcaw Baroy is a major centre for long-term ecological research on estuarine ecosystems, conducted through the Belle W Baruch Institute for Marine Biology and Coastal Research (University of South Carolina) and research on forest ecosystems of the outer coastal plain, conducted through the Belle W Baruch Forest Science Institute (Clemonson University).

CONSERVATION MANAGEMENT The Yawkey Wildlife Centre's management plan is structured around the stipulations in the will of the late Mr Tom Yawkey. It allowed for research, management and education on the majority of the property except for North Island. The Santee Coastal Reserve, (including the Washoo Reserve), Cape Romain and Caper Island all have management plans addressing the various management practices and the species involved. Core areas - North Island 1,821ha was established as Wilderness Area under the Yawkey will and no management activities are allowed. Washoo Reserve 421ha, use restrictions exist under the management of The Nature Conservancy to protect the sensitive rookery area. Hobcaw Barony (7,082ha) is strictly protected for research, education and conservation of natural ecosystems. Buffer zones - 38,664ha. The remaining areas will be in the buffer zones and are managed for wildlife species including waterfowl, deer, turkey and endangered species.

MANAGEMENT PROBLEMS Apart from rice cultivation in the 1800s, the area has experienced very little development.

STAFF There are a total of 120 staff on the reserve.

BUDGET No information

LOCAL ADMINISTRATION
S.C. Wildlife and Marine Reserve, P.O. Box 12559, Charleston, SC 29412.
Washoo Reserve, The Nature Conservancy, P O Box 5475, 724B Meadow Street, Columbia SC 29250.
Cape Romain Refuge, 390 Bulls Island Road, Awendow SC 29499
Hobcaw Barony, Baruch Institute for Marine Biology & Coastal Research, University of South Carolina, P O Box 1630, Georgetown SC 29440

REFERENCES Studies and reports from Tom Yawkey Wildlife Centre are available.

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CURRENT LAND MANAGEMENT: The Yawkey Wildlife [illegible] is stretched across two [illegible] in the will of the late Mr. Yawkey. It allowed for research [illegible] of the property except for South Island. [illegible] Reserve. [illegible] the various management [illegible] Island [illegible] management activities [illegible] exist under the management of [illegible] The remaining [illegible] species including [illegible].

MANAGEMENT PROBLEMS: [illegible] in the 1980s, the area has experienced very little development.

STAFF: There are a total of [illegible] of the property.

BUDGET: No information

LOCAL ADMINISTRATION:
S.C. Wildlife and Marine Resources, P.O. Box [illegible], Charleston, SC [illegible]
[illegible], The Nature Conservancy, P.O. Box [illegible] Columbia SC [illegible]
Cape Romain [illegible]
[illegible], University of South Carolina, [illegible]

REFERENCES: [illegible]
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